University of Bahrain

College of Information Technology
Department of Computer Science

ITCS251/252 Discrete Mathematics

Second Semester 2012/2013
Exam #2 — One Hour

STUDENT NAME	
STUDENT#	
SECTION	

Answer All Questions.
Make sure you have 4 pages.

QUESTION#	MARKS		COMMENTS
1	10		
2	10		
3	6		
4	10		
TOTAL	36		

Instructors: Dr. Ali Alsaffar (Coordinator).
Dr. Ali Khan.
Dr. Yousif Al-Jazeeri.

Q1. Answer all of the following questions.

(a) **[2 marks]** Give a counterexample to the following statement.

"If a and b are integers with $a - b \geq 0$ and $b - a \geq 0$, then $a \neq b$."

(b) **[2 marks]** If $x \notin A \cup B$. Which of the following is true, $x \in A$ or $x \notin A$? Justify your answer.

(c) **[4 marks]** Let $K = \{1, \{\varnothing\}\}$. Find $\mathcal{P}(K)$ and $|\mathcal{P}(\mathcal{P}(K))|$.

$\mathcal{P}(K) =$

$|\mathcal{P}(\mathcal{P}(K))| =$

(d) **[2 marks]** For all sets A, B, and C, draw Venn Diagram such that $A \subseteq C$, $B \subseteq C$, and $A \cap B \neq \varnothing$.

Q2. [**10 marks**] For any integers a and b, if $a^2 + b^2$ is divisible by 4, then either a is not odd or b is not odd.

Q3. Let $U = \{n \in \mathbf{Z} \mid -3 \leq n \leq 3\},\ A_i = \{-i, i\}$. Find the following:

(a) **[2 marks]** $(A_1 \cup A_2) \cap \overline{A_3} =$

(b) **[4 marks]** Is $\{A_1, A_2, A_3\}$ a partition of U? Justify your answer.

Q4. **[10 marks]** For all sets A and B, prove that $(A - B) \cup (B - A) \cup (A \cap B) = A \cup B$.